

Research Supports Sustainable Cattle Production

Before a gallon of milk or a cut of beef winds up on your table, dairy farmers and cattle ranchers must meet a myriad of challenges to produce healthy animals with desirable consumer traits. At the same time, they have to run a profitable business.

Stories in this issue of *Agricultural Research* highlight research at two long-running ARS laboratories that help producers reach their goals.

The U.S. Dairy Forage Research Center in Madison, Wisconsin, celebrates its 20th anniversary this month. Researchers there aim to improve digestibility and nutrition in forage crops like alfalfa and corn silage (see story on page 14). They also develop value-added products from forage legumes and manure to help the environment and the farmer's bottom line.

The Fort Keogh Livestock and Range Research Laboratory in Miles City, Montana, was transferred from the military to the U.S. Department of Agriculture in 1924. Today, researchers at the 55,000-acre laboratory develop technology for sustainable rangeland beef cattle operations. Among their accomplishments are establishing techniques for genetic evaluation of beef cattle—including developing Line 1 Herefords—and identifying birth weight as the primary factor in calving difficulty.

While dairy and beef cattle are usually raised in very different environments, both share a need for good nutrition and successful calving.

Both industries also rely on forage plants to supply their animals with adequate fiber and nutrition. But forage plants are incompletely digested. Up to 40 percent of the plant cell walls in legumes like alfalfa pass through the animals undigested, reducing their nutritional value and increasing the amount of waste produced. It is estimated that increasing the digestibility of the cell walls of forages consumed by American dairy cows by only 10 percent would result in \$350 million in increased milk and meat production, with 2.8 million fewer tons of manure solids.

Madison scientists have contributed significantly to the understanding of cell walls, including a new method for analyzing lignin. Their techniques, which have been widely adopted, may help geneticists and breeders develop forages with modified cell walls that would allow animals to extract more nutrition from the plants.

Nutrition is the costliest component in beef and dairy production—but of course, one of the most crucial as well. Optimal nutrition increases milk production. Miles City researchers have also found it plays a key role in helping heifers grow quickly during their first 2 years, so they are better able

to deliver their first calves easily. Proper supplementation with fat may also help newborn calves withstand cold temperatures out on the range.

Although adequate nutrition is essential, scientists at Ft. Keogh have found that calving difficulty, rebreeding, and calf survival depend on many factors (see story on page 4). A recent study found that low pregnancy rates cost \$198 million in lower production efficiency annually. Calving difficulty, or dystocia, costs more than \$400 million overall to the dairy and beef industries.

So far, studies illustrating the role of birth weight, sire selection, and nutrition have helped producers reduce calf deaths by up to 55 percent and heifer deaths by 80 percent through proper management.

Nutrition research can also benefit the environment. Researchers at the Madison laboratory provide cutting-edge science that enables dairy farmers to better manage nutrients so that excess phosphorus and nitrogen don't wind up in groundwater, lakes, and rivers. For example, they demonstrated that farmers were providing too much phosphorus in dairy cattle diets—excess that could contaminate nearby soil and water.

Feeding dairy cattle according to new requirements set by the National Research Council can save dairy farmers \$100 million annually while reducing phosphorus levels in manure by up to 30 percent. And that doesn't sacrifice milk production or animal health.

As with most agricultural research endeavors, new tools are allowing researchers to expand their studies into never-before-imagined arenas. For example, biotechnology has allowed Madison scientists to define precise biochemical pathways of lignin production. That's giving scientists a clearer understanding of the processes involved in building cell walls. Miles City researchers are examining the inner workings of processes involved in calf development, by homing in on the genetic regions that influence birth weight.

Today's dairy and beef industries—and all the nation's consumers—benefit from past accomplishments at these labs. New information gained through genetics and molecular biology promises to continue these benefits well into the future.

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